

CIVIL AERONAUTICS BOARD

# AIRCRAFT ACCIDENT REPORT

**ADOPTED:** November 8, 1961

**RELEASED:** November 14, 1961

TRANS WORLD AIRLINES, BOEING 707, N 765TW,  
NEW YORK INTERNATIONAL AIRPORT, NEW YORK, MAY 9, 1960

## SYNOPSIS

On May 9, 1960, at 2049 g.m.t., a Trans World Airlines, Boeing 707-331, N 765TW, crashed "wheels up" at New York International Airport. Eight of the 100 passengers aboard received mild injuries during evacuation. The aircraft sustained major damage as a result of contact with the runway and ensuing fire.

Because of a low ceiling and visibility, approach to the airport had to be accomplished on instruments. The instrument approach was poorly executed and visual contact with the runway was established when the aircraft was too high and too close to the runway threshold to be landed safely. Nevertheless, the captain continued the approach until more than one-half of the available runway had passed beneath the aircraft. When the decision was made to abandon the approach, a go-around was initiated. Contrary to company regulations and good operating procedures, the landing gear was raised before a positive climb had been assured. The aircraft touched down and the landing gear retracted. As a result, the aircraft settled to the runway and slid to a stop about 500 feet from the end.

## Investigation

Trans World Airlines Flight 100 is a regular nonstop flight from Los Angeles, California, to New York, New York. On the trip of May 9, 1960, there were 100 passengers and a crew of nine.

The crew made normal preparations for the flight which included filing an IFR flight plan to New York via jet routes 78 and 42 to cruise at 31,000 feet. The estimated time en route was 4 hours 34 minutes with Baltimore, Maryland, as an alternate airport.

The maximum allowable takeoff gross weight was 275,000 pounds; however, actual takeoff weight was 270,447 pounds, including a fuel weight of 117,000 pounds. The center of gravity was within limits.

Flight clearance was received and the aircraft departed Los Angeles International Airport at 1606Z.<sup>1/</sup> It was cleared to cruise via the flight plan route at 33,000 feet. The flight proceeded eastward normally and New York center

<sup>1/</sup> All times herein are Greenwich mean time based on the 24-hour clock; all altitudes are mean sea level.

accepted a radar handoff from the adjoining GCI radar site when Flight 100 was in the area of Front Royal, Virginia. The flight was then directed into the New York area and was descended in preparation for an instrument approach to runway 22L at Idlewild.

Idlewild approach control then established radar contact with the flight and vectored it to intercept the localizer course of the ILS about three miles north-east of the outer marker. The flight was given the latest wind and altimeter setting and advised that the glide slope was inoperative. The weather at the time was given by the tower as ceiling measured 400 feet variable broken, 700 feet overcast; visibility 4 miles in fog; wind from the south at 15K; altimeter setting 29.49.

Captain Harry E. Campbell testified that the trip from Los Angeles had been routine. Descent was made on instruments in the New York area in accordance with instructions from New York center and Idlewild approach control. He said that they had been cleared to make a localizer approach, that they intercepted the localizer about two miles outside of the outer marker at an altitude of 1,500 feet, and that the aircraft was being operated in accordance with all prescribed instructions. He testified that the ILS approach was completely normal; airspeed was maintained constant at reference plus 10 knots (141K); rate of sink was maintained between 500 and 700 feet per minute; and that the aircraft was on the localizer from the outer marker almost all the way down. Captain Campbell testified that he identified the outer marker by the ADF's and the flashing marker beacon light on the instrument panel but that the audible signal for the marker beacon had been turned off. He said the aircraft was being flown on autopilot; that it was on the "localizer feature" of the "automatic coupler," and that he was controlling the altitude by use of throttle. The captain said that he did not recall "hitting" the middle marker and "did not note anything that was other than the normal."

The captain further testified that the autopilot was operating properly and that there were no heading changes made during the approach but that approximately two-thirds of the distance from the outer marker to the runway, while the aircraft was on the localizer, the autopilot, for unknown reasons, disengaged.

The captain further testified that he established visual contact with the runway shortly after the autopilot disengaged. At that time, he said the aircraft was about 100 feet to the right of the runway and between 500 and 1,000 feet from the threshold at an altitude of approximately 400 feet. After dropping full flaps he had to "S" the aircraft to line up with the runway. Approximately half way down the runway and at an altitude of "about 50 feet or perhaps less" he said he decided to abandon the landing and go around. He advanced the power to approximately 2.0/2.30 EPR and gave the command for 30 degrees of flaps and for the gear to be raised. He also said that at the time the command was given to raise the gear the aircraft was to the best of his knowledge in a climbing attitude. When asked if the aircraft was climbing he replied, "We were on the runway."

The captain said he did not see the approach lights during the approach. Then, in answer to a question of what possible factors could have contributed to his "overshoot," Captain Campbell said, "One, no approach lights. Two, no glide path. Three, the automatic pilot became disengaged prior to the threshold of the runway." It might be noted here that the runway lights, narrow-gauge lights, centerline lights, and the high-speed taxi lights are operated from a panel in the control tower cab. Included in the control panel is a monitoring system which

indicates when the power for the various lighting systems is on and if the lights are functioning properly. The monitoring system will also indicate by a warning light and buzzer if any one of the lanes is not operating properly. Testimony of the tower personnel indicated that all the systems were in operation and no outages or failures in the systems were indicated.

Captain Campbell said that immediately after touchdown he heard the landing gear unsafe warning horn and immediately closed the throttles. The airplane settled to the runway and slid to a stop with all three landing gears retracted. He said there was a fire warning signal for engines Nos. 2 and 3 and that he cut off the start levers with the exception of No. 3 which was jammed. He saw that the first officer had started to activate the fire bottles in Nos. 2 and 3 engines but he did not observe whether the bottles were actuated.

First Officer Horace E. Nichols testified substantially the same as Captain Campbell that the flight approach into the New York area was completely normal.

He stated that the approach speed of the aircraft was constant from the outer marker inbound at reference plus 10K. Also that the rate of descent was normal; approximately 500 feet/min.

Mr. Nichols testified that he noted passage of the outer marker by the ADF needles but could not see the flashing marker beacon because it is located on the other side of the cockpit. He also testified that he did not identify the middle marker because they were contact before reaching it. He said, "I say we were contact better - - half a mile from the end of the runway or a little better and this is purely judgment." He then stated that the middle marker was located five-tenths of a mile from the end of the runway. (The location of the middle marker for runway 22L is actually six-tenths nautical miles from the runway threshold.)

Mr. Nichols also said that just before becoming contact he "sensed" the airplane had started a slight right turn and out of the corner of his eye he could see the automatic pilot disengage warning light flashing. This warning light is located on the lower left side of the center instrument panel. It is below and slightly to the right of the airways marker beacon light.

Visual contact was established two or three seconds later and, according to Mr. Nichols, the aircraft was about 150 feet to the right of the runway centerline and at an altitude of 450 feet. He said Captain Campbell lined the aircraft up with the runway and continued the approach. He could not estimate the altitude of the aircraft as it crossed the threshold but did say it was approximately 50 to 75 feet in the air and halfway down the runway when the captain initiated a "go-around." He said the captain told him they were going around, applied power, and ordered 30 degrees of flaps and gear up. Mr. Nichols stated that upon the captain's order he raised the flap handle to the 30-degree position, noted that the indicator began to move, and then raised the landing gear handle to the up position. He said he did not know whether the aircraft was still descending when he raised the gear because he was occupied with checking the flap and gear indications and was not looking out of the cockpit.

Mr. Nichols stated that the landing gear warning horn did not sound until the aircraft contacted the runway. As the aircraft slid to a halt the fire warning

sounded for engines Nos. 2 and 3. Mr. Nichols stated that he armed the fire selectors for these engines but that as he was about to actuate the extinguisher all electrical power went off the airplane.

The flight engineer, Mr. Outhwaite, stated that he heard the fire warning bell sound as the aircraft was sliding on the runway. After coming to rest he said he heard someone say that there was a fire in No. 2. Mr. Outhwaite said before leaving the cockpit he secured the flight engineer's panel in accordance with company procedures for anticipated crash landings by turning off every switch he could find, including the battery switch. Turning the battery switch off interrupts power to the D. C. bus and makes it impossible to actuate the fire extinguishers.

At the time of the accident, the TWA emergency checklist called for turning the battery switch off prior to landing when a crash landing or ditching was anticipated. Action was initiated immediately after the accident to revise the fire extinguishing system circuits and remove them from the D. C. bus. This would permit utilization of a "hot" circuit to this system which can then be actuated either automatically or manually. As a temporary measure the battery switch item has been removed from the current emergency checklist and thus will not be turned off for an anticipated crash landing.

After the aircraft came to rest, evacuation of the passengers was accomplished quickly but with some difficulty. The left front passenger loading door was opened by the captain and first officer and the emergency chute was lowered. It would not inflate so the captain, first officer, and two male passengers descended to the ground and held the chute secure. About 25 or 30 persons left the aircraft by this exit.

The right front (forward galley) door was opened and after some difficulty the emergency chute was properly secured in place and inflated. It was estimated that about 25 to 30 persons left by this exit. The two hostesses seated in the aft section of the aircraft opened the right rear (rear galley) door after observing fire on the left side of the aircraft. Several male passengers who had deplaned via the over-the-wing emergency exits were outside the door and assisted approximately 45 to 50 passengers to the ground. The emergency chute was not needed at this exit and no attempt was made to use it.

Firefighting equipment arrived at the aircraft promptly and immediately extinguished fires which had developed on engines Nos. 2 and 3. Eight passengers received minor or comparatively minor injuries during the evacuation.

All structural damage to the aircraft resulted from the aircraft sliding along the runway on its fuselage belly. Examination also revealed that the damage sustained by the Nos. 2 and 3 powerplants was the result of this contact with the runway and the ensuing fire. Powerplants Nos. 1 and 4 were undamaged. As a result of crew testimony and examination of the engines, all four were determined to have been capable of normal operation prior to the accident.

All the aircraft systems were checked and found to be operating normally. In addition, no evidence could be found to indicate a malfunction in the autopilot. (It is noted in the aircraft operating manual that actuation of the electric stabilizer trim thumb switch will disconnect the autopilot.)

The aircraft was equipped with a flight recorder which was operating properly during the accident. The tape covering the last portion of the flight was read and found to contain rather significant information. Airspeed was found to have been about 165K at the outer marker inbound. It then increased to about 170K, for a period of about one minute. It then began to decrease to approximately 141K at the middle marker; then to about 128K at the first point of touchdown.

The acceleration trace indicated slight turbulence throughout the approach and a series of heavy accelerations at runway contact with several indicated peak loads of 3.2 and 4.2 gs.

The heading trace from the outer marker inbound was extremely erratic. The aircraft heading varied almost 30 degrees during the approach.

The altitude recording and rates of descent calculated from it were also very significant. The aircraft crossed the outer marker at an altitude of about 1,200 feet. Its rate of descent during the next minute was approximately 100 feet per minute. The rate of descent then increased to about 1,200 feet/min. and the aircraft descended to about 650 feet. The descent continued at a much lesser rate for a short period and the aircraft then began a gentle climb as it reached the vicinity of the middle marker. Shortly after this the airplane was again dived at a rate of at least 1,000 feet/min. until it contacted the runway.

A TWA spokesman stated that the training program for checkout in the 707 consisted of three weeks of ground school, 12 hours at the controls of the simulator with approximately the same amount of time as observer, and a minimum of eight hours of transition time in the aircraft followed by an FAA rating check ride. He said however that these are minimum times and that the company experience in qualifying over 160 captains is that an average flight time of about 20-1/2 hours in the aircraft and 14 to 15 hours of simulator time is actually required for checkout.

During this time, he stated, considerable instruction and practice in standard go-around techniques is given to every captain but that most rejected landings would be given from ILS approaches at an altitude of about 200 feet or more. The procedure taught is: Advance power to take off thrust; retract flaps to 30 degrees; retract landing gear after positive rate of climb is assured. Since the accident, the witness said that the company has reemphasized that the landing gear is not to be raised until a positive rate of climb is assured.

The operations manual also cautions against the use of 50 degrees (full) flaps to correct for a high approach as excessive rates of sink might develop.

He also testified that company procedures prohibited the use of autopilot after passing the outer marker inbound if any component of the ILS is inoperative.

### Analysis

Nothing was found during the investigation of this accident which would indicate a failure or malfunction of the aircraft, its powerplants, or systems. In addition, the crew members stated that the flight had been routine and that no discrepancies or malfunctions had been encountered. The flight recorder was also found to operate normally subsequent to the accident. It was also recalibrated and found to be accurate within tolerances prescribed by civil air regulations.

No substantiating evidence was found to indicate a malfunction in the autopilot or to account for its disengagement as reported by the captain. Even so, the alleged malfunction should not have affected the captain's ability to continue his approach successfully. By the captain's own testimony the aircraft was on the localizer centerline when the disengagement occurred. The copilot's statement that he sensed a slight right turn is the only indication of any deviation from the flightpath as a result of the reported disengagement. The Board cannot therefore attach any significance to a malfunction such as was reported.

As for the captain's testimony concerning the three factors cited to account for his overshooting the runway, the Board cannot agree that these should have had any serious adverse effects on the completion of a properly executed instrument approach. The malfunction of the autopilot has been discussed above. In addition, company regulations prohibit use of the automatic pilot for a coupled instrument approach when no glide slope is available.

The captain's allegation that the approach lights were not in operation appears to be unfounded. No outage was recorded and numerous aircraft had made similar approaches immediately preceding Flight 100. Also, although the Board does not downgrade the importance or usefulness of approach lighting systems it does believe that this approach should have been completed successfully even without such assistance. Even though the sky was overcast it was daylight and there was adequate light; visibility was about four miles. Further, the crew stated the runway was visible immediately upon breaking out of the clouds.

The captain was well aware that no glide slope was available on this runway and should have set up a constant rate of descent which would have brought the aircraft down its approach so as to break out of the overcast at the proper point. If the captain had felt that executing an instrument approach without a glide slope was not completely safe, then his only action should have been to proceed to his alternate where a safe approach could be made.

The flightpath of this aircraft from the outer marker inbound was extremely erratic. It is difficult to believe that the autopilot was ever even engaged unless it was malfunctioning all the way down the localizer. Heading changes of more than 20 degrees and rapid altitude changes such as are evidenced from the flight recorder readout could not have occurred unless this were true. However, the crew was unanimous in stating that no malfunction occurred prior to the disengagement two-thirds of the way down the approach. Further, these extreme readings were not a result of a malfunction of the flight recorder as it operated normally after the accident. From this evidence it appears that the aircraft was flown by hand or that it was on autopilot but being controlled by the pilot by means of the autopilot turn and pitch controllers. All the evidence indicates a lack of competency in the equipment and a lack of instrument proficiency.

With a properly executed approach, this aircraft should have broken out of the overcast at an altitude of approximately 400 feet (about 20 seconds), or almost eight-tenths of a mile, before reaching the middle marker. At this point the runway would have been visible and the landing could have been made successfully. It is obvious to the Board that the approach was not executed in this manner.

Immediately upon breaking contact it should have been obvious to the crew that the aircraft was too high and too close to the runway and that the approach

should have been abandoned. From the position described by the captain, a flightpath of 21 degrees from the horizontal would have been required to land at the beginning of the runway. From the position described by the copilot, a flightpath of about nine degrees would have been required. A normal approach would result in a glidepath of around 2-4 degrees.

It is also evident that the captain continued his approach despite the fact that he was at an altitude of about 275 feet over the threshold. If it was not obvious to the crew that a go-around would be necessary when they first became contact, it most certainly should have been evident when they crossed the threshold at this extreme height.

In spite of this the captain continued his approach until approximately one-half of the runway was behind him. Then at an altitude of about 50 feet he initiated a go-around. Again the technique employed by the captain indicates a complete lack of proficiency with the equipment. The captain advanced the power levers, called for 30 degrees of flaps, and gear up. Instead of applying takeoff thrust, as called for in the go-around procedure, he advanced the throttles to approximately 2.0/2.3 EPR. At 125K this would result in about 12,450 pounds of thrust per engine. Under conditions existing on that day, the takeoff power setting of 2.55 EPR would have been available which would produce 14,730 pounds of thrust. Actually the airplane performance at 2.30 EPR would be good and a go-around possible; however, at 2.55 EPR it is probable that less altitude would have been lost during rotation to climb attitude and before a positive climb would have been effected.

It is also apparent that the captain did not make certain that a positive rate of climb had been established before ordering the landing gear retracted. This is a specific requirement in the go-around procedure and is spelled out in the operations manual. In addition, it is just good common sense to make certain the airplane is not going to touch down before retracting the landing gear.

Inasmuch as a normal go-around is not an emergency, the normal procedures set out in the aircraft manuals should be followed. The copilot who actually performs the duty should make certain the aircraft is climbing and will not touch down before he moves the gear handle. He has a responsibility in the safe operation of the aircraft and should at least call to the attention of the captain any dangerous situation of which he is aware. It appears to the Board that the copilot, as well as the captain, should have been aware that the aircraft was not climbing out when the gear was retracted. The duties the copilot was performing were not so arduous as to prevent him from ensuring that a positive rate of climb had been established.

### Conclusions

It is the Board's conclusion that there was no mechanical failure of the aircraft or its systems which contributed to the cause of this accident. The Board also concludes that the instrument approach was executed improperly. As a result, the crew established visual contact at a point too high and too close to the runway to effect a normal landing. It should have been obvious to the captain immediately that a go-around would be necessary; however, he continued his approach over one-half of the distance down the runway before attempting to go-around.

The Board further concludes that the techniques employed by the captain in abandoning his landing attempt were contrary to company rules and procedures and were improper. It is obvious that a positive rate of climb did not exist when the landing gear was retracted and further that none of the pilots was properly attentive to the conditions existing.

The Board is greatly concerned about the conduct of this flight. The evidence adduced during the investigation indicates a lack of training and competence in the aircraft which cannot be overlooked. Several items, which have been previously mentioned, seem to substantiate the Board's conclusion on this matter. First, the captain said he was utilizing the VOR-LOC mode of the autopilot even though he knew there was no glide slope signal. This is directly contrary to company regulations. Second, the altitude of the aircraft at the outer marker was 1,200 feet. Minimum authorized altitude at that point is 1,500 feet. Third, the aircraft airspeed varied considerably from that described by the crew members. Fourth, both the rate of descent and the aircraft heading varied dangerously despite the testimony of the crew. Fifth, the application of power was made with little regard to established procedures with the result that takeoff power was not used for the go-around. Sixth, the captain ordered the landing gear retracted prematurely and the copilot complied despite the fact that the aircraft was still descending.

#### Probable Cause

The Board determines the probable cause of this accident was a poorly conducted instrument approach necessitating a go-around which was initiated too late and improperly executed.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD  
Chairman

/s/ ROBERT T. MURPHY  
Vice Chairman

/s/ CHAN GURNEY  
Member

/s/ G. JOSEPH MINETTI  
Member

/s/ WHITNEY GILLILLAND  
Member



## S U P P L E M E N T A L   D A T A

### Investigation and taking of Depositions

The Civil Aeronautics Board was notified of this accident on May 9, 1960. An investigation was immediately initiated in accordance with the provisions of Title VII of the Federal Aviation Act of 1958. The taking of depositions was ordered by the Board and conducted in the Federal Building, New York International Airport, New York, New York, on June 15, 1960.

### Flight Personnel

Captain Harry E. Campbell, age 55, was employed by Trans World Airlines on May 10, 1929, and was promoted to captain in September of that year. He holds a valid FAA airline transport pilot certificate with ratings in the Lockheed Constellation, Boeing 707, 100, and 300 series aircraft, and also has a multiengine land rating.

Captain Campbell has logged flying time in excess of 27,000 hours of which approximately 750 hours are in the Boeing 707. His latest FAA Class I physical examination was given on November 30, 1959. He was given a line check by a company pilot on January 25 and 26, 1960; given an instrument check on January 12, 1960; and on that same day, given a review on emergency equipment. While in training, Captain Campbell had 29:45 flying time in the Boeing 707.

First Officer Horace E. Nichols, age 40, was employed by Trans World Airlines on October 3, 1947, and was promoted to captain on March 25, 1957. He holds an airline transport pilot certificate with ratings in the Lockheed Constellation and Martins 202, 404 aircraft plus single and multiengine land ratings. He has logged a total of 15,765 flying hours with 867 hours in the Boeing 707. He received five hours training time in the Boeing 707; but has logged no instrument time in that aircraft.

Mr. Nichols last line check by a company pilot was February 27, 1960, and his six-month instrument check was on February 12, 1960. He had a review of emergency equipment on February 12, 1960.

Second Officer Louis F. Gorczyca, age 29, was employed by Trans World Airlines on October 8, 1956, and was promoted to copilot on November 26, 1956. His total flying time is 1,695 hours (exclusive of military time) and he has logged 685 hours in the Boeing 707; however he has had one hour at the controls of that aircraft--this hour was acquired in training.

Mr. Gorczyca holds a valid commercial pilot certificate with single and multiengine land rating, instrument rating and type rating in the Lockheed Constellation aircraft. He completed a line check given by a company pilot on February 27, 1960, and the date of his last six-month instrument check was February 12, 1960. He had an emergency equipment review on November 8, 1959.

Flight Engineer Mark W. Outhwaite, age 49, was employed by Trans World Airlines on June 12, 1941, and promoted to flight engineer on July 28, 1943.

He has a total of 11,431 flying hours and 143 hours in the Boeing 707. Mr. Outhwaite holds a valid FAA flight engineer certificate and an airframe and powerplant mechanic certificate. His last line check was completed on March 22, 1960, and he reviewed the emergency equipment procedures on February 26, 1960.

#### The Carrier

Trans World Airlines is a Delaware corporation with principal offices in Kansas City, Missouri. This corporation holds a current certificate of public convenience and necessity for scheduled and nonscheduled operations, and possesses valid air carrier operating certificates for these operations.

#### The Aircraft

The aircraft was a Boeing 707, model 331 Intercontinental, United States Registry No. N-765TW owned by the Hughes Tool Company and operated by Trans World Airlines. It bears a date of manufacture of January 18, 1960, and manufacturer's serial number 17679. The total time on the airframe was 943:12. The entire aircraft had received its No. 5 line maintenance inspection 38:16 hours prior to the accident.

The engines were Pratt and Whitney Model JT 4A-9 dual axial compressor turbojet engine. Number 1 engine had 242:37; number 2 had 38:16; number 3 had 658:41; and number 4 had 38:16 time since last overhaul.